

## DISCUSSION

Upon entry of the present amendment, Claims 1-13 remain in the application, of which, Claims 1 and 6 are independent. New claims 14-20 are also being added by the present amendment, and of these new claims, claim 17 is independent.

The above-identified Office Action has been reviewed, the references carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present Amendment is submitted. It is contended that by the present amendment, all bases of rejection set forth in the Office Action have been traversed and overcome. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

### Claim Rejections – 35 USC § 103

In item 3 of the Office Action, the Examiner rejected claims 1-4, 6-8, 10 and 13 under 35 USC § 103(a) as unpatentable over Hihara et al. (JP 2002-060845).

Applicant disagrees with, and traverses this ground of rejection.

JP '845 merely discloses a method for prolonging the service life of a casting die formed of alloy tool steel and having a surface nitriding treated layer, which process involves subjecting the die to another nitriding treatment whenever the residual stress of the surface nitriding treated layer drops to approximately half of its initial value. As discussed in the present specification, e.g., at page 2, line 14 – page 3, line 11, while nitriding treatment is a conventionally known process for enhancing the durability of a steel casting die, nitriding treatment is not remarkably

effective at enhancing the die durability, even if the nitriding treatment is combined with other treatments such as carburizing treatment and boronizing treatment.

In addition, Hihara '845 fails to teach, disclose or suggest any specific level of surface roughness, nor is there reason to engage in any experimentation relative to any surface roughness.

Further, in the present amendment, applicant has amended each of the independent claims to specify that a maximum height of roughness of the cavity surface is not more than 16  $\mu\text{m}$  or, in some instances, not more than 8  $\mu\text{m}$ .

For all of the foregoing reasons, applicant requests reconsideration and withdrawal of the rejection of claims 1-4, 6-8, 10 and 13 under 35 USC § 103(a) as unpatentable over Hihara et al.

In item 4 of the Office Action, the Examiner rejected claims 5, 9 and 11-12 under 35 USC § 103(a) as unpatentable over Hihara et al. in light of Chiba (JP 10-204610).

Applicant traverses this ground of rejection, for those reasons discussed herein with respect to claims 1-3 and 6 above, which are not overcome by any additional teachings of JP '610.

For all of the foregoing reasons, applicant requests reconsideration and withdrawal of the rejection of claims 5, 9 and 11-12 under 35 USC § 103(a) as unpatentable over Hihara et al. in light of Chiba.

### New Claims

Applicant has added new claims 14-20 by the present amendment.

Claim 14 depends from claim 6, and specifies that hydrogen gas is applied to the cavity surface during the nitriding treatment.

Claim 15 depends from claim 5, and specifies that the nitrided layer is a compound diffusion layer containing both iron sulfide and iron nitride.

Claim 16 depends from claim 6, and specifies that ammonia gas, hydrogen sulfide gas, and hydrogen gas are applied to the cavity surface during the nitriding treatment to form a compound diffusion layer containing both iron sulfide and iron nitride.

Claim 17 is a new independent product-by-process claim to a steel die which is a product of a process comprising the steps of:

a) performing a coarse peening step;

b) after the coarse peening step, applying a gaseous mixture comprising a sulfurizing gas and a nitriding gas to the cavity surface of the die in a processing chamber under controlled temperature conditions to form a sulphonitrided diffusion layer thereon; and

c) subsequently, performing a finishing peening step;

wherein a residual stress of the cavity surface is larger than 1200 MPa, and a maximum height of roughness of the cavity surface is not more than 8  $\mu\text{m}$ .

Claim 18 depends from claim 17 and specifies that the coarse peening step comprises applying water-borne ceramic particles to the cavity surface of the die, the ceramic particles having particle diameters between 200 and 220 mesh. Claim 18 further specifies that the fine peening step comprises applying water-borne glass particles to the cavity surface of the die, the glass particles having particle diameters between 200 and 220 mesh.

Claim 19 depends from claim 17, and specifies that the temperature in the processing chamber is maintained in a range between 505 degrees Celsius and 580 degrees Celsius during the gaseous mixture application step.

Claim 20 depends from claim 17 and specifies that the gaseous mixture comprises ammonia gas, hydrogen sulfide gas, and hydrogen gas.

Each of these new claims is fully supported by the specification as originally filed, and the respective limitations of each of the new claims are not taught or suggested by any of the references of record.

### **Conclusion**

Applicant respectfully suggests that as presently amended, all of the pending claims are believed to be allowable.

It is applicant's contention that no possible reading of the references, either singly or in any reasonable combination, can be viewed as teaching applicant's claimed invention.

For all of the above mentioned reasons, applicant requests reconsideration and withdrawal of the rejection of record, and allowance of each of the pending claims.

Applicant respectfully submits that all of the above amendments are fully supported by the original application. Applicant also respectfully submits that the above amendments do not introduce any new matter into the application.

Favorable consideration is respectfully requested.

Respectfully submitted,



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